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EXAMINER

BRADLEY, MATTHEW A

ART UNIT	PAPER NUMBER
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2187

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/798,962	Applicant(s) COCHRAN ET AL.	
	Examiner Matthew Bradley	Art Unit 2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

This Office Action has been issued in response to Appeal Brief filed 2 April 2007. Applicant's arguments have been carefully and fully considered and are partially persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made. Accordingly, this action has **NOT** been made final.

The Examiner wishes to draw attention to the change of examiner in this case and apologizes for any inconvenience as a result of this change.

Claim Status

Claims 1-32 remain pending and are ready for examination.

Claim Rejections - 35 USC § 112

The 35 U.S.C. 112 1st rejections set forth in the Office Action dated 2 November 2006 have been withdrawn in light of Applicant Arguments filed in the form of an Appeal brief on 2 April 2007.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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1. **Claims 1-4, 6, 13-17, 19 and 26-32** are rejected under 35 U.S.C. 103(a) as being anticipated by Iwamura et al. (US 2005/0038968), hereinafter referred to as Iwamura et al, and in view of Carteau (U.S. 2002/0083281), hereinafter referred to as Carteau.
2. **With respect to claim 1**, Iwamura et al. disclose a data synchronization method for a redundant data storage arrangement in which there are at least
 - a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2) and
 - mirroring first (170 of Figs. 1 and 19; paragraph 0040, line 2) and second (180 of Figs. 1 and 19; paragraph 0040, lines 2-3) remote storage entities in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraphs 0064 and 0237 describe the synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site), respectively,
 - writes to the first and second remote storage entities being tracked via respective first (CL1904 of Figs. 19 and 20) and second (DL1906 of Figs. 19 and 20) sidefiles (paragraph 0245),
 - the first and second storage entities having different levels of write-currency relative to each other (paragraph 0237 describes synchronous link between host and synchronous site; paragraph 0238 describes asynchronous link between host and asynchronous site using a "DB log transmission program"),

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Iwamura et al does not explicitly teach receiving acknowledgements from the second remote storage entity at both the primary storage entity and the first remote storage entity.

Carteau teach,

- receiving acknowledgements from the second remote storage entity at both the primary storage entity and the first remote storage entity (Paragraph 0027 of Carteau);

Iwamura et al and Carteau teach,

- comparing acknowledgements and sequence numbers in the first sidefile with acknowledgements and sequence numbers in the second sidefile (paragraph 0236; paragraph 0261, lines 3-7 of Iwamura et al and Paragraph 0027 of Carteau); and
- updating writes stored at the second remote storage entity based upon the comparison of the first and second sidefiles (paragraph 0261, lines 3-7 of Iwamura et al).

Iwamura et al and Carteau are analogous art because they are from the same field of endeavor namely, data backup systems.

At the time of invention, it would have been obvious to one of ordinary skill in the art, having both the teachings of Iwamura et al and Carteau before him/her to combine the sending of acknowledgments to both the first and host computer of Carteau with Iwamura et al for the benefit of complete efficient resynchronization after a break in the mirroring process.

The suggestion for doing so would have been that, this logging allows efficient resynchronization after mirroring is broken (Paragraph 0027 of Carteau). Further, sending acknowledgements to the first controller in addition to the host computer ensures a complete log file and allows for complete confidence in restoration.

Therefore, it would have been obvious to combine Iwamura et al with Carteau for the benefit of complete and efficient resynchronization after a break in the mirroring process to obtain the invention as specified in claims 1-4, 6, 13-17, 19 and 26-32.

3. **With respect to claim 2**, the combination of Iwamura et al. and Carteau disclose the method of claim 1 (see above paragraph 2) wherein the updating of writes includes forwarding to the second remote storage entity writes that are present in the first sidefile but not yet present in the second sidefile (paragraph 0261 of Iwamura et al.).
4. **With respect to claim 3**, the combination of Iwamura et al. and Carteau disclose the method of claim 1 (see above paragraph 2) wherein the comparing is done on the basis of sequence numbers associated with the writes (paragraph 0236 and paragraph 0261, lines 7-12 of Iwamura et al.).
5. **With respect to claim 4**, the combination of Iwamura et al. and Carteau disclose the method of claim 1 (see above paragraph 2), further comprising:
 - establishing a communication connection between the first and second remote storage entities in response to the primary storage entity becoming

inoperative (paragraphs 0244, 0251 of Iwamura et al.; when the primary site fails, the synchronous site updates the asynchronous site);

- wherein the comparing and updating are also performed in response to the primary storage entity becoming inoperative (paragraphs 0255-0266 of Iwamura et al. describe updating process in response to failure, and paragraph 0261, lines 1-7 details comparing and updating).

6. **With respect to claim 6**, the combination of Iwamura et al. and Carteau disclose the method of claim 1 (see above paragraph 2), further comprising: adaptively adjusting the number of writes that can be stored in the first sidefile (paragraph 0266, lines 6-11 of Iwamura et al.; a copy of the extensible log file is kept in the synchronous site).

7. **With respect to claim 13**, the combination of Iwamura et al. and Carteau disclose a redundant data storage arrangement comprising:

- a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2 of Iwamura et al) to
 - (1) forward writes to each of a mirroring first and second remote storage entity (paragraphs 0237-0238 of Iwamura et al) and
 - (2) forward acknowledgements from the second remote storage entity to the first remote storage entity (paragraph 0027 of Carteau);
- the mirroring first remote storage entity (170 of Figs. 1 and 19; paragraph 0040, line 2 of Iwamura et al), in communication with the primary storage entity (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link

between host and synchronous site of Iwamura et al), which includes a first sidefile (CL1904 of Figs. 19 and 20 of Iwamura et al) via which writes forwarded from the primary storage entity are tracked (paragraph 0245 of Iwamura et al); and

- the mirroring second remote storage entity (180 of Figs. 1 and 19; paragraph 0040, lines 2-3 of Iwamura et al), in communication with the primary storage entity (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4; paragraph 0238 describes communication between host and asynchronous site of Iwamura et al), which includes a second sidefile (DL1906 of Figs. 19 and 20 of Iwamura et al) via which writes forwarded from the primary storage are tracked (paragraph 0245 of Iwamura et al);
- the first and second storage entities having different levels of write-currency relative to each other (paragraphs 0064 and 0237 describes synchronous link between host and synchronous site; paragraph 0238 describes asynchronous link between host and asynchronous site using a "DB log transmission program" of Iwamura et al);
- an initiating one of the first and second remote storage entities being operable to
 - compare acknowledgements and sequence numbers in the first and second sidefiles (paragraph 0236; paragraph 0261, lines 3-7 of Iwamura et al), and

- invoke an updating of writes stored at the second remote storage entity based upon the comparison of the first and second sidefiles (paragraph 0261, lines 3-7 of Iwamura et al).

8. **With respect to claim 14**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein the updating is performed by the first remote storage entity, which is operable to do so by forwarding to the second remote storage entity writes that are present in the first sidefile but not yet present in the second sidefile (paragraph 0261 of Iwamura et al.).

9. **With respect to claim 15**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein each of the first and second remote storage entities is operable to

- preserve in the respective sidefile sequence numbers associated with the writes (paragraph 0246 of Iwamura et al.); and
- sort the respective sidefile according to the sequence numbers (paragraph 0261, lines 1-7 of Iwamura et al.).

10. **With respect to claim 16**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein:

- the initiating one is further operable to establish a communication connection between itself and the other remote storage entity in response to the primary storage entity becoming inoperative (paragraphs 0244,

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0251 of Iwamura et al.; when the primary site fails, the synchronous site updates the asynchronous site); and

- the comparison and the update are performed in response to the primary storage entity becoming inoperative (paragraphs 0255-0266 of Iwamura et al. describe updating process in response to failure, and paragraph 0261, lines 1-7 details comparing and updating).

11. **With respect to claim 17**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein the first remote storage entity is closer in proximity to the primary storage entity than the second remote storage entity (paragraph 0042, lines 5-8 of Iwamura et al.).

12. **With respect to claim 19**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein: the first remote storage entity is operable to adaptively adjust the number of writes that can be stored in the first sidefile (paragraph 0266, lines 6-11 of Iwamura et al.; a copy of the extensible log file is kept in the synchronous site).

13. **With respect to claim 26**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein each of the first and second remote storage entities represents a tracked write in the first and second sidefile (paragraph 0058 of Iwamura et al.), respectively, with: location information as to where on a physical medium the write is to be performed (paragraph 0076, lines 1-5 of Iwamura et

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al.); actual data associated with the write that is to be written to the physical medium (paragraph 0265, lines 1-7 of Iwamura et al.); and a sequence number uniquely associated with the write (paragraph 0076, lines 7-13, paragraph 0265, lines 1-7 both of Iwamura et al.).

14. **With respect to claim 27**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein the first remote storage entity receives writes forwarded synchronously from the primary storage entity (paragraph 0237 of Iwamura et al. describes the synchronous link between host and synchronous site); and the second remote storage entity receives writes forwarded asynchronously from the primary storage entity (paragraph 0238 of Iwamura et al. describes communication between host and asynchronous site).

15. **With respect to claim 28**, the combination of Iwamura et al. and Carteau disclose a data synchronization method for a redundant data storage arrangement in which there are at least a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2 of Iwamura et al.) and mirroring first (170 of Figs. 1 and 19; paragraph 0040, line 2 of Iwamura et al.) and second (180 of Figs. 1 and 19; paragraph 0040, lines 2-3 of Iwamura et al.) remote storage entities in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site of Iwamura et al.), respectively, the method comprising:

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- synchronously receiving writes at the first remote storage entity that have been forwarded from the primary storage entity (paragraph 0237 of Iwamura et al. describes the synchronous link between host and synchronous site); and
- maintaining a sidefile (CL1904 of Figs. 19 and 20 of Iwamura et al.) via which are tracked items that include
 - acknowledgements from the second remote storage entity received at both the primary storage entity and the first remote storage entity (paragraph 0027 of Carteau),
 - sequence numbers assigned to writes (paragraph 0236 of Iwamura et al.),
 - writes received at the first remote storage entity (paragraph 0245 of Iwamura et al.), and
 - writes received at the second remote storage entity (paragraph 0245 of Iwamura et al.).

16. **With respect to claim 29**, the combination of Iwamura et al. and Carteau disclose a mirroring first remote storage entity for a redundant data storage arrangement in which there are at least the first remote storage entity (170 of Figs. 1 and 19; paragraph 0040, line 2 of Iwamura et al.) and a primary storage entity (100 of Figs. 1 and 19; paragraph 0040, lines 1-2 of Iwamura et al.) in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link between host and synchronous site, all of Iwamura et al.), and a mirroring

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second remote storage entity (180 of Figs. 1 and 19; paragraph 0040, lines 2-3 of Iwamura et al.) in communication with the primary storage entity (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0238 describes communication between host and asynchronous site of Iwamura et al.), respectively, the first remote storage entity comprising:

- memory to store data (1903 and 1904 of Fig. 19; paragraph 0237 of Iwamura et al., *note*: elements are mislabeled as 1093 and 1094); and
- a processor (paragraph 0084 of Iwamura et al. describes how a CPU executes programs stored in subsystems, so therefore synchronous site 170 has a CPU) operable to
 - synchronously receive writes that have been forwarded from the primary storage entity (paragraphs 0064 and 0237); and
 - maintain a sidefile (1904 of Figs. 19 and 20 of Iwamura et al.) in the memory via which are tracked items that include
 - acknowledgements from the second remote storage entity received at both the primary storage entity and the first remote storage entity (Paragraph 0027 of Carteau),
 - sequence numbers assigned to writes (paragraph 0236 of Iwamura et al.),
 - writes received at the first remote storage entity (paragraph 0245 of Iwamura et al.), and
 - writes received at the second remote storage entity (paragraph 0261, lines 1-7 of Iwamura et al.).

17. **With respect to claim 30**, the combination of Iwamura et al. and Carteau disclose a data synchronization method for a redundant data storage arrangement in which there a primary storage entity (100 of Figs. 1, 19 and 22; paragraph 0040, lines 1-2 of Iwamura et al.) and mirroring first (170 of Figs. 1, 19 and 22; paragraph 0040, line 2 of Iwamura et al.) and second (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3 of Iwamura et al.) remote storage entities in communication therewith (160 of Fig. 1, arrows indicating communication of Fig. 19; paragraph 0040, lines 3-4, paragraph 0237 describes the synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site of Iwamura et al.), respectively, the method comprising:

- synchronously forwarding to the first remote storage entity writes from the primary storage entity (paragraphs 0064 and 0237 of Iwamura et al.);
- informing the first remote storage entity regarding writes acknowledged to have been received at the second remote storage entity (paragraph 0027 of Carteau);
- comparing
 - (1) the writes acknowledged to have been received (paragraph 0236 and paragraph 0261, lines 7-12 of Iwamura et al.) and
 - (2) sequence numbers assigned to writes to determine data content at the second remote storage entity (paragraph 0236 and paragraph 0261, lines 7-12 of Iwamura et al.).

18. **With respect to claim 31**, the combination of Iwamura et al. and Carteau disclose a primary storage entity for a redundant data storage arrangement in which there are at least the primary storage entity and mirroring first and second remote storage entities in communication therewith, respectively, the primary storage entity comprising:

- memory to store data (225A of Figs. 2, 19 and 22; paragraph 0265, lines 1-6 of Iwamura et al.); and
- a processor (111 of Fig. 1; paragraph 0047, line 1 of Iwamura et al.) operable to
 - synchronously forward writes to the first remote storage entity (paragraphs 0064 and 0237 of Iwamura et al.);
 - receive indications of writes acknowledged to have been received at the second remote storage entity (paragraph 0027 of Carteau); and
 - inform the first remote storage entity regarding the indications (paragraph 0266, lines 6-11, a copy of the journal file system 2202 is kept in the synchronous site 170 of Iwamura et al.);
 - assign sequence numbers to writes (paragraph 0236 of Iwamura et al.)
 - send the sequence numbers to first and second remote storage entities (paragraph 0236 and paragraph 0261, lines 7-12 of Iwamura et al.).

19. **With respect to claim 32**, the combination of Iwamura et al. and Carteau disclose a redundant data storage arrangement comprising:

- primary storage means (125 of Fig. 1 of Iwamura et al.) for storing writes received from a host (paragraph 0052 of Iwamura et al.);
- first remote mirror means for mirroring writes forwarded from the primary storage means (170 of Figs. 1, 19 and 22; paragraph 0040, line 2 of Iwamura et al.) and for tracking such writes via a first sidefile (CL1904 of Figs. 19 and 20; paragraph 0245 of Iwamura et al.); and
- second remote mirror means for mirroring writes forwarded from the primary storage means (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3 of Iwamura et al.) and for tracking writes such writes via a second sidefile (DL1906 of Figs. 19 and 20; paragraph 0245 of Iwamura et al.);
- the first and second storage entities having different levels of write-currency relative to each other (paragraphs 0064 and 0237 describes synchronous link between host and synchronous site; paragraph 0238 describes communication between host and asynchronous site using a "DB log transmission program" of Iwamura et al.);
- the first sidefile including
 - (1) sequence numbers assigned to writes (paragraph 0236 of Iwamura et al.) and
 - (2) acknowledgements from the second remote mirror means (paragraph 0027 of Carteau);

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- the second sidefile including sequence numbers assigned to writes (paragraph 0236 and paragraph 0261, lines 7-12 of Iwamura et al.);
- comparison means, responsive to the primary storage means being rendered inoperative, for comparing the first and second sidefiles (paragraph 0261, lines 1-7 of Iwamura et al.), and
- update means, responsive to the comparison, for updating writes stored at the second remote mirror means based upon the comparison of the first and second sidefiles (paragraph 0261, lines 1-7 of Iwamura et al.).

20. **Claims 5 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura et al. (US 2005/0038968) and in view of Carteau (U.S. 2002/0083281) as applied to claims 1-4, 6, 13-17, 19 and 26-32 above (see paragraphs 2-19), and further in view of Frederick (US 6,912,483).

21. **With respect to claim 5**, the combination of Iwamura et al. and Carteau disclose the method of claim 1 (see above paragraph 2), configuring the first (CL1904 of Figs. 19 and 20; paragraph 0245 of Iwamura et al) and second (DL1906 of Figs. 19 and 20; paragraph 0245 of Iwamura et al) sidefiles to store a fixed number of writes therein, respectively (paragraph 0266, lines 5-8 of Iwamura et al). The combination of Iwamura et al. and Carteau do not disclose the limitation further comprising adding a new write to the first and second sidefiles by overwriting the oldest write therein, respectively.

However, Frederick discloses the limitation further comprising adding a new write to the first and second sidefiles by overwriting the oldest write therein, respectively (column 6, lines 54-55 of Frederick).

Iwamura et al. and Carteau and Frederick are analogous art because they are from the same field of endeavor, namely data logging.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the circular logging of Frederick with the method of Iwamura et al. and Carteau for the benefit of a method with a circular log.

The motivation for doing so would have been so that "each log... has a fixed size in memory" (column 6, lines 52-53 of Frederick).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Frederick with Iwamura et al. and Carteau for the benefit of a method with a circular log to obtain the invention as specified in claim 5.

With respect to claim 18, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), wherein the first means (170 of Figs. 1, 19 and 22; paragraph 0040, line 2 of Iwamura et al) and second (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3 of Iwamura et al) remote storage entities are configured to store a fixed number of writes therein, respectively (paragraph 0266, lines 5-8 of Iwamura et al). Iwamura et al. also disclose the first (CL1904 of Figs. 19 and 20; paragraph 0245 of Iwamura et al) and second (DL1906 of Figs. 19 and 20; paragraph 0245 of Iwamura et al) sidefiles. wherein the first and second remote storage entities are operable to add a new write to the first and second sidefiles by overwriting the oldest write therein, respectively (column 6, lines 54-55 of Frederick).

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Iwamura et al. and and Carteau Frederick are analogous art because they are from the same field of endeavor, namely data logging.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the circular logging of Frederick with the redundant data storage arrangement of Iwamura et al and Carteau for the benefit of a method with a circular log.

The motivation for doing so would have been so that "each log... has a fixed size in memory" (column 6, lines 52-53 of Frederick).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Frederick with Iwamura et al. and Carteau for the benefit of a redundant data storage arrangement with a circular log to obtain the invention as specified in claim 18.

22. **Claims 7-9 and 20-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura et al. (US 2005/0038968) and in view of Carteau (U.S. 2002/0083281) as applied to claims 1-4, 6, 13-17, 19 and 26-32 above (see paragraphs 2-15), and further in view of McDowell (US 6,260,125).

23. **With respect to claim 7**, the combination of Iwamura et al. and Carteau disclose the method of claim 6 (see above paragraph 6). The combination of Iwamura et al. and Carteau do not disclose the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile.

However, McDowell discloses the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile (column 8, lines 3-6 of McDowell).

Iwamura et al. and Carteau and McDowell are analogous art because they are from the same field of endeavor, namely logging of writes in a mirrored data system.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the log file adjustment of McDowell with the method of Iwamura et al and Carteau for the benefit of a method with log file adjustment.

The motivation for doing so would have been "to keep the log file size manageable" (column 8, line 3 of McDowell).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine McDowell with Iwamura et al. and Carteau for the benefit of a method with log file adjustment to obtain the invention as specified in claims 7-9.

With respect to claim 8, the combination of Iwamura et al. and Carteau and McDowell teach wherein the adaptive adjustment more particularly is based upon the write stored in the second sidefile which has the oldest contiguous sequence number (column 8, lines 7-10 of McDowell).

24. **With respect to claim 9**, the combination of Iwamura et al. and Carteau and McDowell disclose the method of claim 7 (see above paragraph 23) disclose the limitations further comprising:

- identifying at least some of the writes stored in the second sidefile (DL1906 of Figs. 19 and 20 of Iwamura et al) (paragraph 0236 of Iwamura et al); and then

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- accordingly informing the first remote storage entity (170 of Figs. 1 and 19; paragraph 0040, line 2 of Iwamura et al) regarding such identities (paragraph 0236 indicates that a sequential ID may be substituted for time stamps; paragraphs 0252-0254 describe how time stamps are compared by host 271 of synchronous site 170 of Fig. 19, and the sequential IDs could be substituted for time stamps, so the IDs would be transmitted to the synchronous site of Iwamura et al).

25. **With respect to claim 20**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 19 (see above paragraph 12). The combination of Iwamura et al. and Carteau do not disclose the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile.

However, McDowell discloses the limitation wherein the adaptive adjustment is based upon the writes that are stored in the second sidefile (column 8, lines 3-6 of McDowell).

Iwamura et al. and Carteau and McDowell are analogous art because they are from the same field of endeavor, namely logging of writes in a mirrored data system.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the log file adjustment of McDowell with the redundant data storage arrangement of Iwamura et al and Carteau for the benefit of a redundant data storage arrangement with log file adjustment.

The motivation for doing so would have been “to keep the log file size manageable” (column 8, line 3 of McDowell).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine McDowell with Iwamura et al. and Carteau for the benefit of a redundant data storage arrangement with log file adjustment to obtain the invention as specified in claims 20-22.

With respect to claim 21, the combination of Iwamura et al. and Carteau and McDowell disclose the redundant data storage arrangement of claim 20 (see above paragraph 26) and wherein the adaptive adjustment more particularly is based upon the write stored in the second sidefile, which has the oldest newest sequence number (column 8, lines 7-10 of McDowell).

26. **With respect to claim 22**, the combination of Iwamura et al. and Carteau and McDowell disclose the redundant data storage arrangement of claim 20 (see above paragraph 25), wherein:

- the primary storage entity (100 of Fig. 19, paragraph 0229, line 5 of Iwamura et al.) is operable to identify at least some of the writes stored in the second sidefile (DL1906 of Figs. 19 and 20 of Iwamura et al.) (paragraph 0236; the database 1907 of Fig. 19 creates the IDs, and is a component of the primary storage unit 100 of Fig. 19 of Iwamura et al.); and then
- accordingly informing the first remote storage entity (170 of Figs. 1 and 19; paragraph 0040, line 2 of Iwamura et al.) regarding such identities (paragraph 0236 indicates that a sequential ID may be substituted for time

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stamps; paragraphs 0252-0254 describe how time stamps are compared by host 271 of synchronous site 170 of Fig. 19, and the sequential IDs could be substituted for time stamps, so the IDs would be transmitted to the synchronous site of Iwamura et al.).

27. **Claims 10-12 and 23-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwamura et al. (US 2005/0038968) and in view of Carteau (U.S. 2002/0083281) as applied to claims 1-4, 6, 13-17, 19 and 26-32 above (see paragraphs 2-15), and further in view of Harter, Jr. (US 6,098,179).

28. **With respect to claim 10**, the combination of Iwamura et al. and Carteau disclose the method of claim 1 (see above paragraph 2), and the first sidefile (CL1904 of Figs. 19 and 20; paragraph 0245 of Iwamura et al.) and the second remote storage entity (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3 of Iwamura et al.). The combination of Iwamura et al. and Carteau do not disclose the limitation further comprising: configuring the first sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received.

However, Harter, Jr. discloses the limitation further comprising: configuring the first sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (column 7, line 65 -- column 8, line 4 of Harter, Jr.).

Iwamura et al. and Carteau and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the method of Iwamura et al and Carteau for the benefit of a method with an acknowledgement field.

The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (column 8, lines 2-4 of Harter, Jr.).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al. and Carteau for the benefit of a method with an acknowledgement field to obtain the invention as specified in claims 10-12.

With respect to claim 11, the combination of Iwamura et al. and Carteau and Harter, Jr. disclose the method of claim 1 (see above paragraph 2) further comprising: providing a third sidefile via which writes received thereby are tracked (AL 1902 of Figs. 19 and 20; paragraph 0234, lines 3-7 of Iwamura et al) and further comprising: configuring the third sidefile to include a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (column 7, line 65 -- column 8, line 4 of Harter, Jr.).

With respect to claim 12, the combination of Iwamura et al. and Carteau and Harter, Jr. disclose the method of claim 11 (see above paragraph) further comprising: configuring the third sidefile further to track whether a write-acknowledgement forwarded from the second remote storage entity has been

acknowledged as having been received by the first remote storage entity (paragraph 0270, a write completion message is stored in journal file system 2202 on the primary storage site 110 after a write to the asynchronous site 180 of Iwamura et al). and further comprising: configuring the third sidefile further to include a field that is used to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity (column 7, line 65 -- column 8, line 4 of Harter, Jr.).

29. **With respect to claim 23**, the combination of Iwamura et al. and Carteau disclose the redundant data storage arrangement of claim 13 (see above paragraph 7), and the first sidefile (CL1904 of Figs. 19 and 20; paragraph 0245 of Iwamura et al) and the second remote storage entity (180 of Figs. 1, 19 and 22; paragraph 0040, lines 2-3 of Iwamura et al). Iwamura et al. do not disclose the limitation wherein the first sidefile includes a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received.

However, Harter, Jr. discloses the limitation wherein the first sidefile includes a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (column 7, line 65 -- column 8, line 4 of Harter, Jr.).

Iwamura et al. and Carteau and Harter, Jr. are analogous art because they are from the same field of endeavor, namely data transmission between storage entities.

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the acknowledgement field of Harter, Jr. with the redundant data storage arrangement of Iwamura et al and Carteau for the benefit of a redundant data storage arrangement with an acknowledgement field.

The motivation for doing so would have been to communicate "an indication as to whether the responding node's PCI/MC adapter is in a hardware error state" (column 8, lines 2-4 of Harter, Jr.).

Therefore, it would have been obvious to a person of ordinary skill in the art to combine Harter, Jr. with Iwamura et al and Carteau for the benefit of a redundant data storage arrangement with an acknowledgement field to obtain the invention as specified in claims 23-25.

With respect to claim 24, the combination of Iwamura et al. and Carteau and Harter, Jr. disclose the redundant data storage arrangement of claim 13 (see above paragraph 7) wherein: the primary storage entity includes a third sidefile to track writes received thereby (AL 1902 of Figs. 19 and 20; paragraph 0234, lines 3-7 of Iwamura et al) wherein: the first sidefile including a field that is used to track whether a write has been acknowledged by the second remote storage entity as having been received (column 7, line 65 -- column 8, line 4 of Harter, Jr.).

30. **With respect to claim 25**, the combination of Iwamura et al. and Carteau and Harter, Jr. disclose the redundant data storage arrangement of claim 24 (see above paragraph) wherein the first sidefile further tracks whether a write-acknowledgement forwarded from the second remote storage entity has been

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acknowledged as having been received by the first remote storage entity (paragraph 0270, a write completion message is stored in journal file system 2202 on the primary storage site 110 after a write to the asynchronous site 180 of Iwamura et al) wherein the first sidefile further includes a field that is used to track whether a write-acknowledgement forwarded from the second remote storage entity has been acknowledged as having been received by the first remote storage entity (column 7, line 65 -- column 8, line 4 of Harter, Jr.).

Response to Arguments

Applicant's arguments, filed 2 April 2007, have been fully considered and are partially persuasive.

With respect to applicant's argument located within the third paragraph of the eleventh page of the remarks (numbered as page 11) which recites:

"Iwamura does not teach or suggest using acknowledgements as part of his rollback process for database recovery."

The Examiner respectfully disagrees: This argument is not completely commensurate in scope with the claim language in that the claim language does not recite a rollback process for database recovery. The claim language however, is directed to the comparing of acknowledgments and sequence numbers such that updated writes can be made based on a comparison. The Examiner refers Applicants to Iwamura paragraph 0236 wherein Iwamura teach that a missing number can be recognized during a recovery or update as instantly claimed, the recovery being taught in paragraph 0235. When Carteau's acknowledgment feature is combined with Iwamura, the system of Iwamura can

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recognize missing numbers in addition to missing acknowledgements. Thus the combination of Iwamura and Carteau as shown above, teach using acknowledgements as part of the process for recovery.

With respect to applicant's argument located within the sixth paragraph of the eleventh page of the remarks (numbered as page 11) which recites:

"Iwamura though, never teaches or suggests comparing both acknowledgements and sequence numbers as recited in claim 1."

The Examiner respectfully disagrees and refers Applicants to the comments and rejection made *supra*.

Applicant's arguments drawn to claims 13 and 28-32 are substantial duplicates to the aforementioned specific arguments in which case the Examiner refers Applicants to the comments and rejection made *supra*.

Any other argument not specifically addressed is considered moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. U.S. 2003/0191916 McBrearty et al teach a cascading mirror backup system.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew Bradley whose telephone number is (571) 272-8575. The examiner can normally be reached on 6:30-3:00 M-F.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald A. Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BRP/mb


Brian R. Peugh
Primary Examiner
